Cyanobacteria Blooms on Utah Lake

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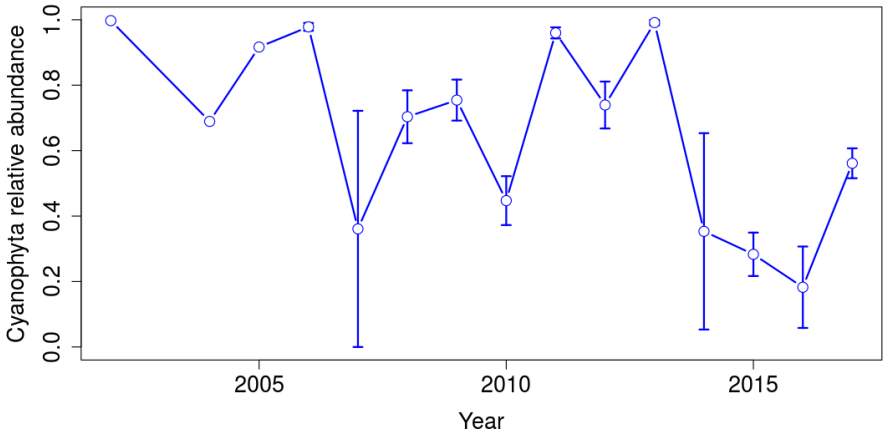
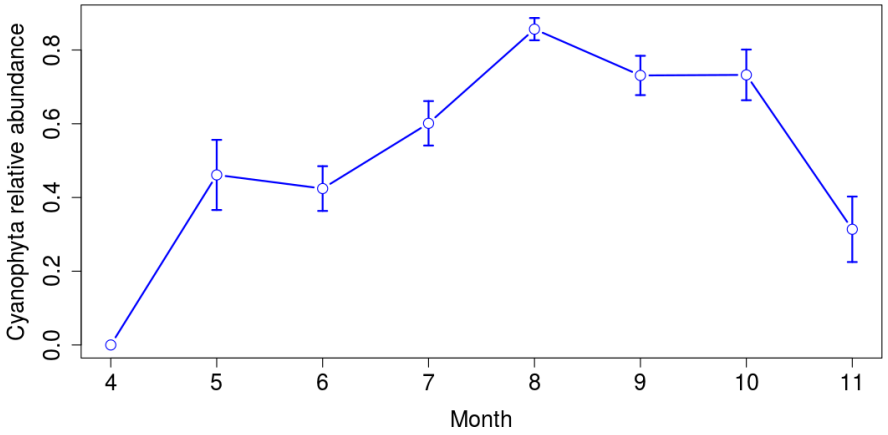
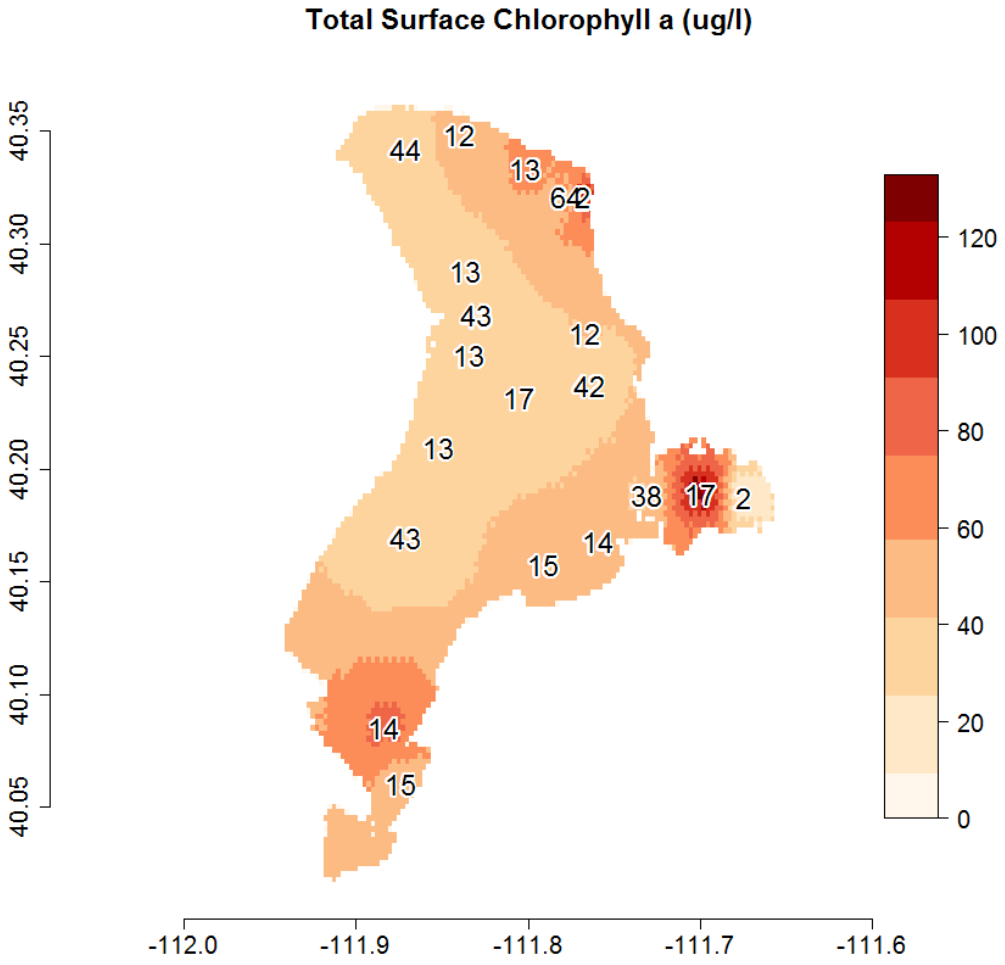
Utah Lake CyanoHAB History

Temporal cyano domination

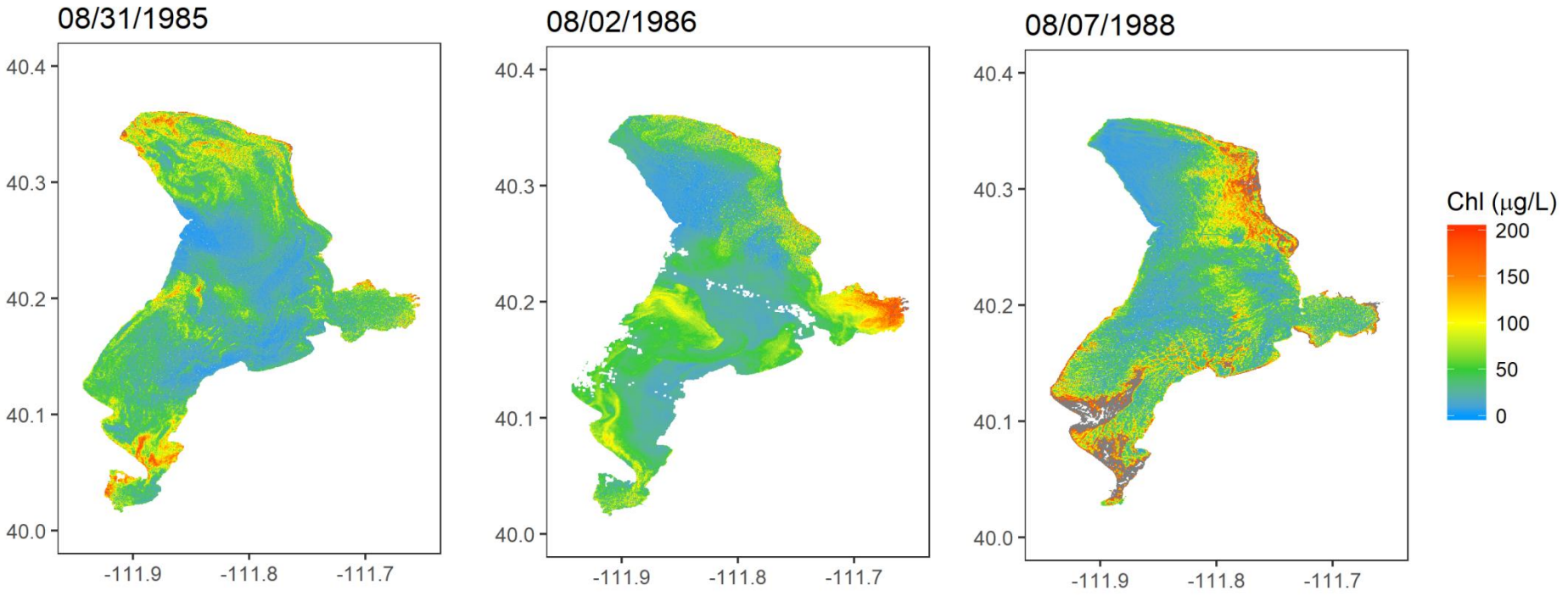




Spatial Patterns

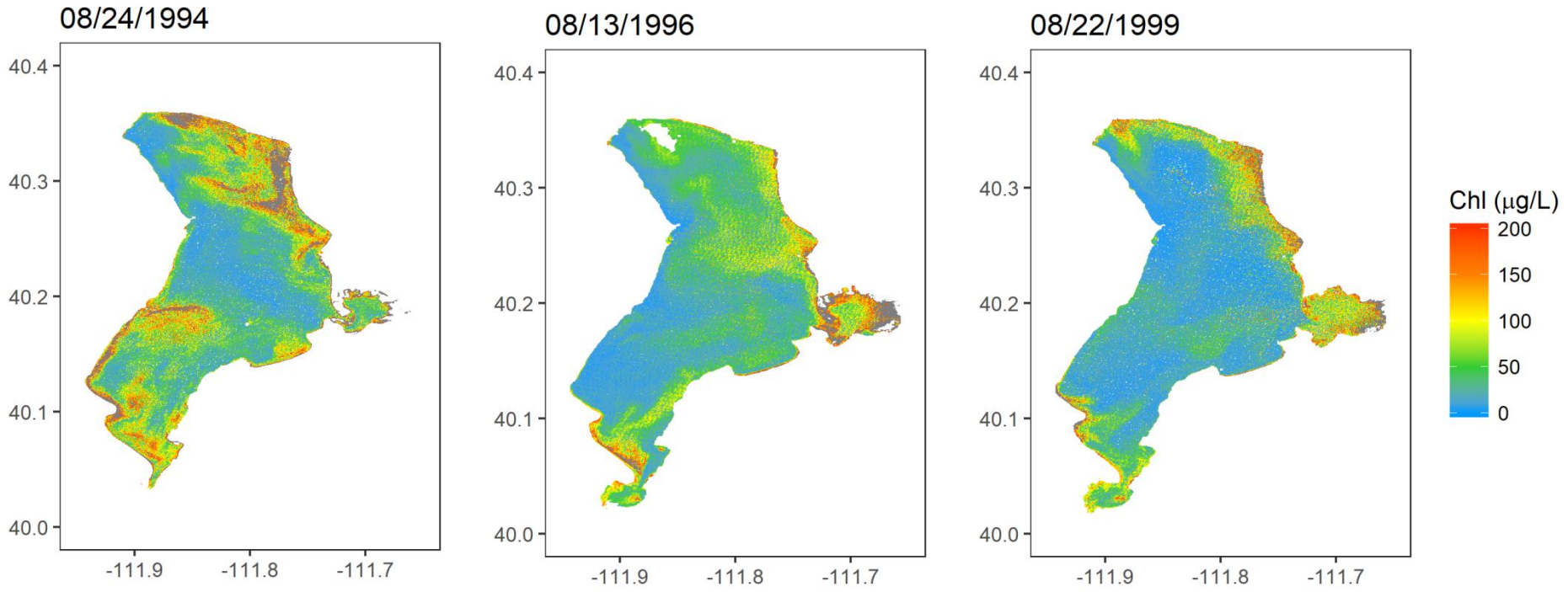


Historical blooms: late ‘80s



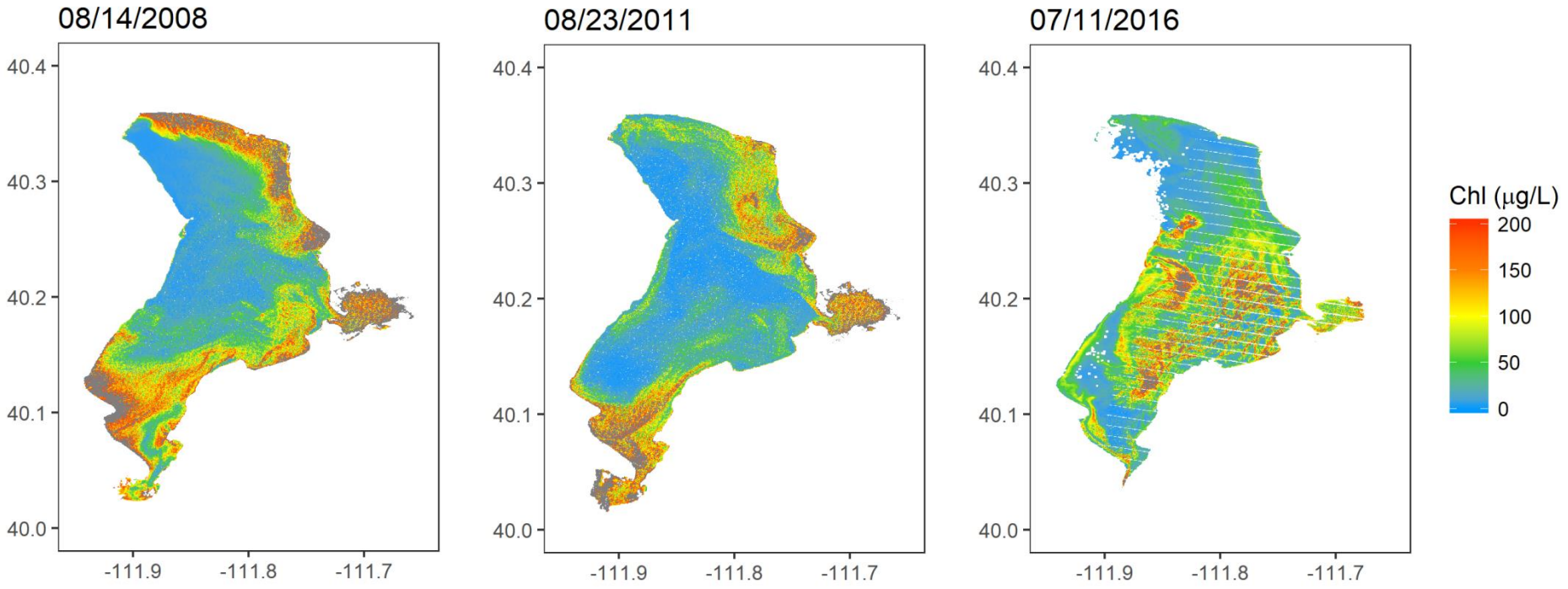
Hansen et al. 2018

Historical blooms: ’90s



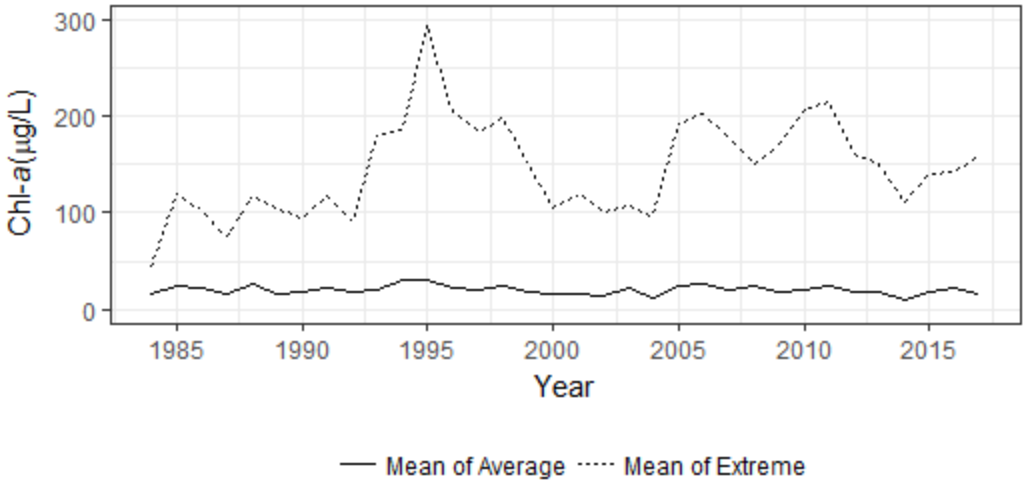
Hansen et al. 2018

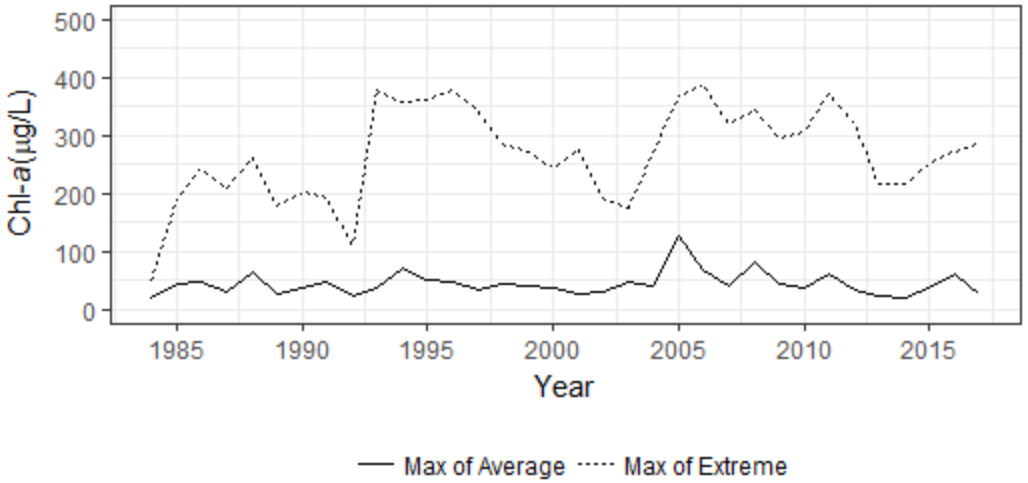
Historic blooms: recent decade



Hansen et al. 2018

Interpolated chlorophyll-a trends





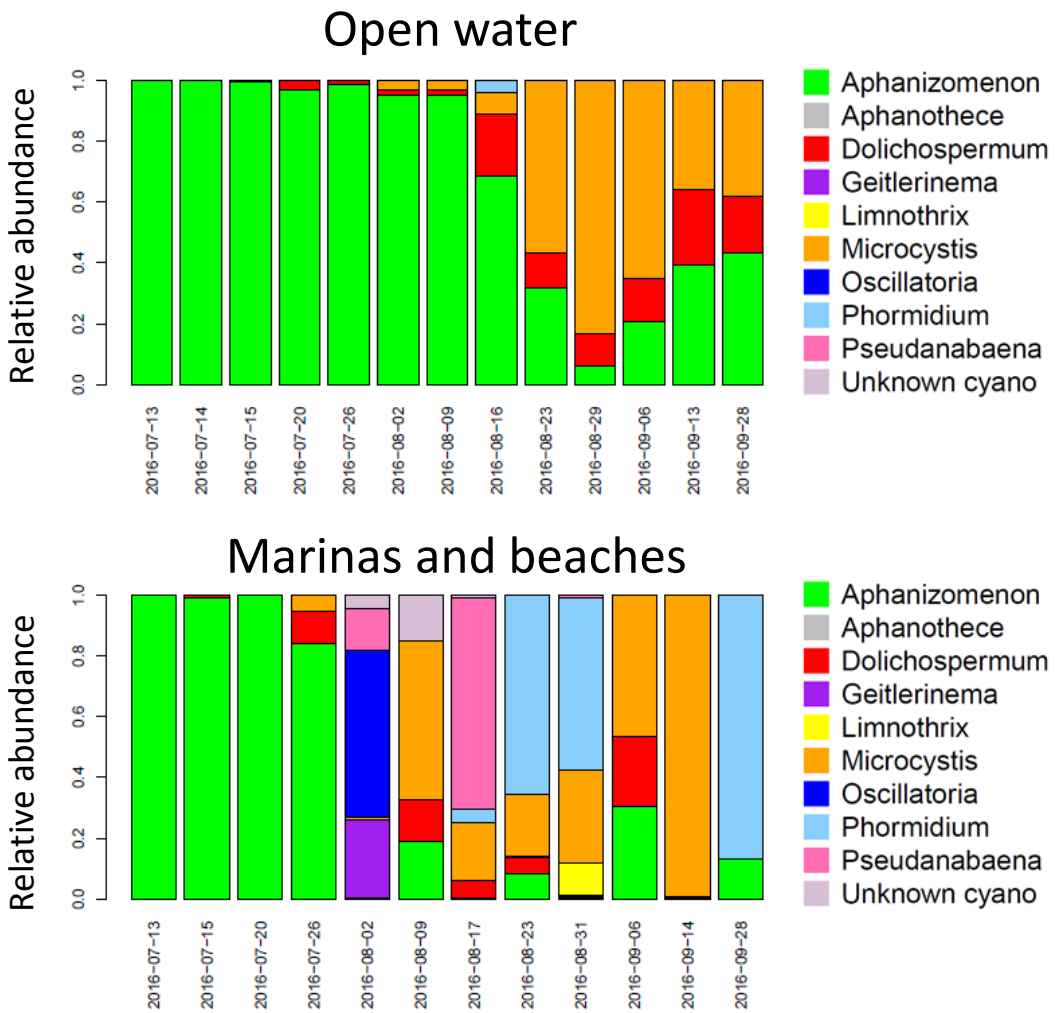
- 1984-2016: chlor-a average is steady
- Maximum concentrations have a significant increasing trend.
- Small increasing trend in variability (measured via standard deviation)
- Significant trend in the timing of when annual maximum occurs (~2 days earlier per year over the 32 year period).

Hansen et al. 2018

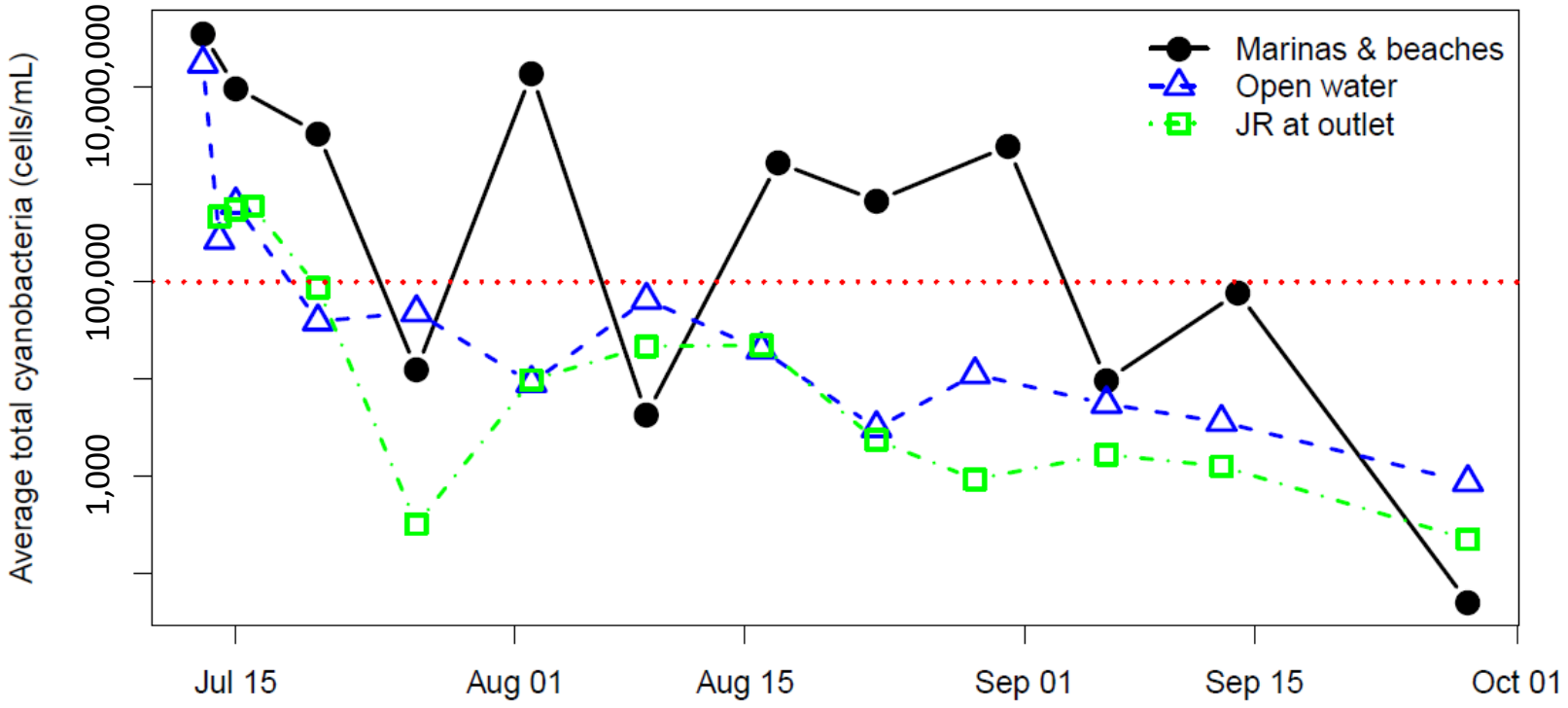
Landsat 8
July 11, 2016

Utah Lake July 2016

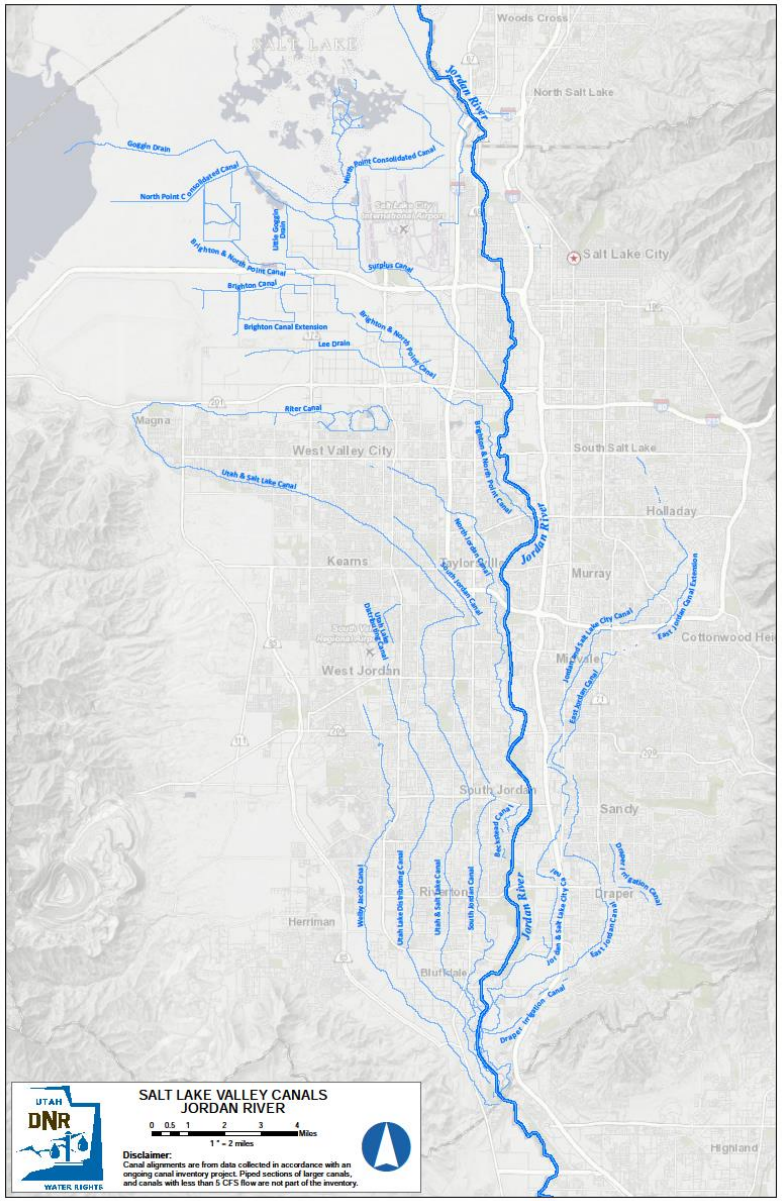
2016 Harmful Algae Blooms



2016 Harmful Algae Blooms

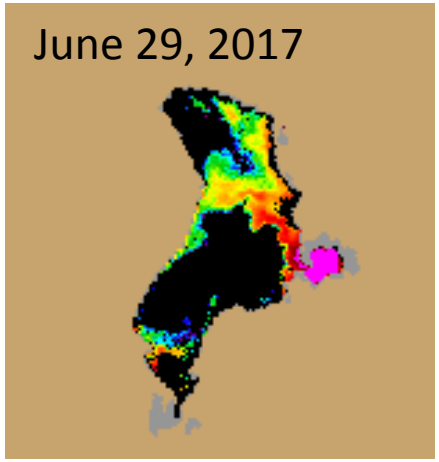


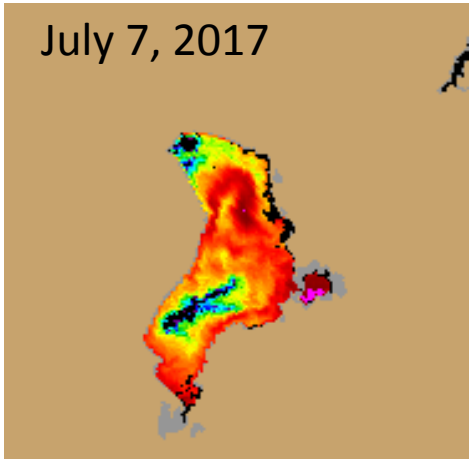
Exported downstream

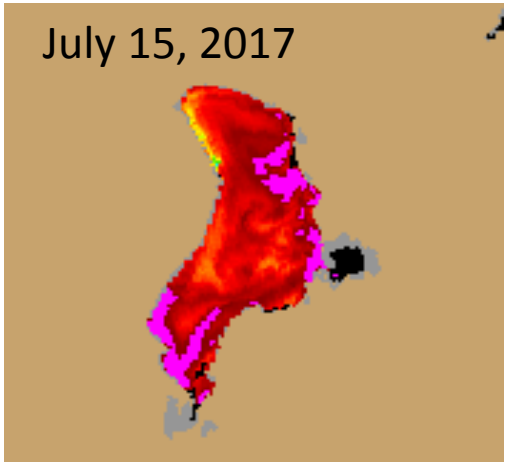


June 27, 2017

Use of satellite images for HAB detection and movement on Utah Lake

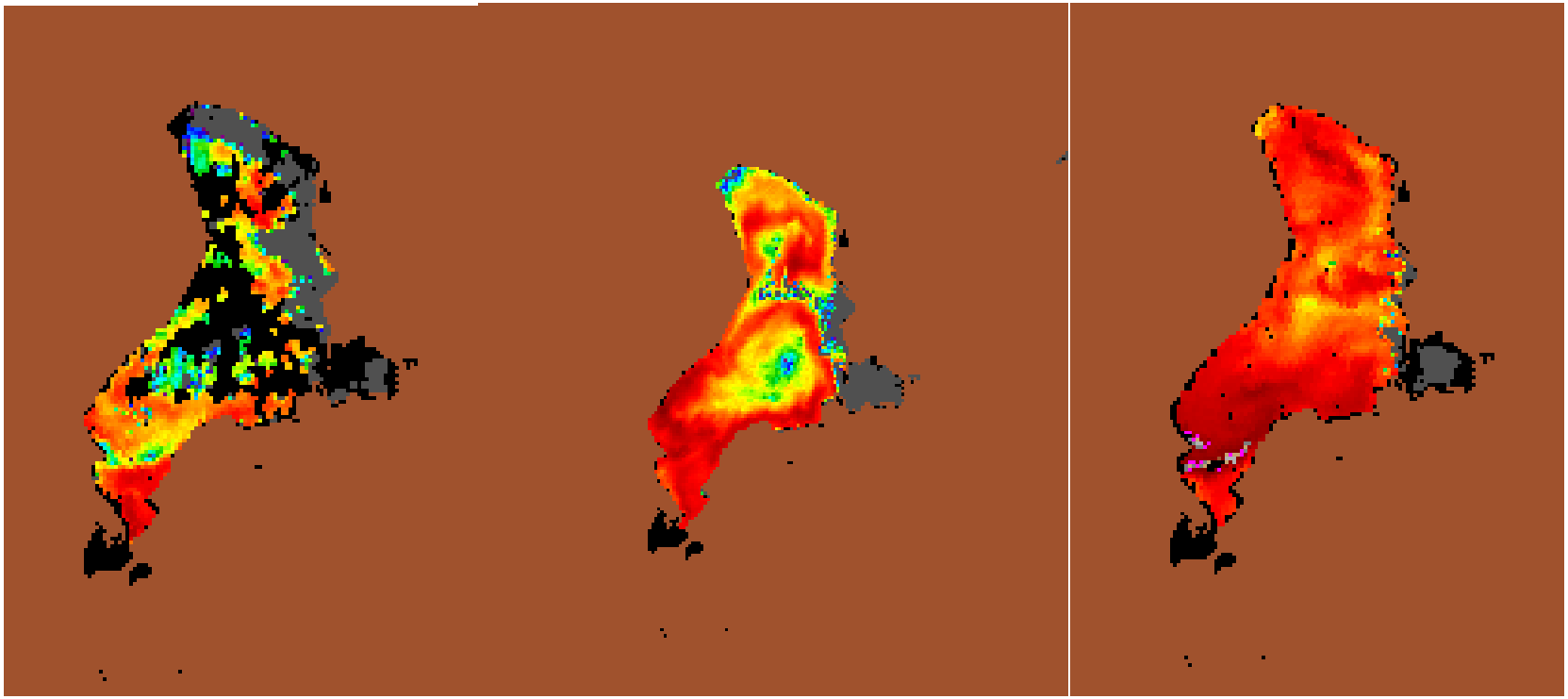






ESA Sentinel-3
Interpolation via
CyAN Project

2018 Activity



July 28, 2018

July 31, 2018

August 5, 2018

2016-2018 Cyanobacteria Incident Highlights

Year	2016	2017	2018
Dates	July – November 2016	June – November 2017	June -- ongoing
Dominant Cyano Composition	*Aphanizomenon sp.*	Multiple: 15 Genera	*Dolichospermum sp.*
Highest Cell concentration (cells/ml)	Main: >35 million	Main: 620,000 Marina: 5.7 million	Main: 2.5 million Marina: 40 million
Highest toxin value (ug/L)	Main: 5 MCY Marina: >10 MCY	Main: 4.4 MCY Marina: >5 MCY	Main: 8.2 MCY Marina: >500 MCY

Setting Expectations

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What is success?

- Multiple lenses: Regulatory? Citizenry/community? Today/Tomorrow?
- Shallow lake success stories…
- Warming climate context; Calculating resiliency
- Scarce resource and multiple uses
- Source for downstream communities

Downstream Waters: Jordan River – Great Salt Lake

~80 tons/year total phosphorus exported to Jordan River from Utah Lake

Farmington Bay

Impounded Wetlands

Wetlands and Ponds

Jordan River

Utah Lake

Key Questions

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Social:

- What is success?
- What are the economic benefits?

Scientific:

- Water residency time?
- Phosphorus retention rate?
- Denitrification rate?
- N-fixing rate?

Rhetorical:

- How to achieve resiliency?

QUESTIONS

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